

## Appendix A

## Claim Amendments

1. (Currently amended) A process for preparing an optically pure proton pump inhibitor (PPI) having a sulfinyl structure selected from the group consisting of 5methoxy-2-[(4-methoxy-3,5-dimethyl-2-pyridinyl)methylsulphinyl]-1H-benzimidazole, (S)-5methoxy-2-[(4-methoxy-3,5-dimethyl-2-pyridinyl) methylsulphinyl]-1H-benzimidazole, 5difluoromethoxy-2-[(3,4-dimethoxy-2pyridinyl)methylsulphinyl]-1H-benzimidazole, 2-[3-methyl-4-(2,2,2-trifluoroethoxy)-2-pyridinyl)methylsulphinyl]-1Hbenzimidazole, 2-[[4-[3-methoxypropoxy]-3-methylpyridin-2yl]methylsulphinyl)-1H-benzimidazole, (S)-2-[3-methyl-4-(2,2,2-trifluoroethoxy)-2-pyridinyl)methylsulphinyl]-1Hbenzimidazole,  $(S)-2-\{[4-[3-methoxypropoxy)-3$ methylpyridin-2-yl]methylsulphinyl}-1H-benzimidazole, (S)-5-methoxy-2-((4-methoxy-3,5-dimethyl-2pyridylmethyl)sulphinyl}-1H-imidazo(4,5-b)pyridine, (R)-5methoxy-2-[(4-methoxy-3,5-dimethyl-2pyridinyl)methylsulphinyl]-1H-benzimidazole, (R)-5difluoromethoxy-2-[(3,4-dimethoxy-2pyridinyl)methylsulphinyl]-1H-benzimidazole, (R)-2-[3methyl-4-(2,2,2-trifluoroethoxy)-2-

pyridinyl)methylsulphinyl]-1H-benzimidazole, (R)-2-{(4-(3-methoxypropoxy)-3-methylpyridin-2-yl)methylsulphinyl}-1H-benzimidazole and (R)-5-methoxy-2-((4-methoxy-3,5-dimethyl-2-pyridylmethyl)sulphinyl)-1H-imidazol(4,5-b)pyridine

and 5-methoxy-2-((4-methoxy-3,5-dimethyl-2-pyridylmethyl)sulphinyl)-1H-imidazo(4,5-b)pyridine

enantiomerically pure or enantiomerically enriched form comprising oxidizing a corresponding sulfide of said PPI, wherein the oxidation is carried out in the presence of a chiral zirconium complex or a chiral hafnium complex.

2. (Currently amended) A process for preparing an optically pure PPI having a sulfinyl structure selected from the group consisting of 5-methoxy-2-[(4-methoxy-3,5-dimethyl-2-pyridinyl)methylsulphinyl]-1H-benzimidazole, (S)-5-methoxy-2-[(4-methoxy-3,5-dimethyl-2-pyridinyl)methylsulphinyl]-1H-benzimidazole, 5-difluoromethoxy-2-[(3,4-dimethoxy-2-pyridinyl)methylsulphinyl]-1H-benzimidazole, 2-[3-methyl-4-pyridinyl)methylsulphinyl]-1H-benzimidazole, 2-[3-methyl-4-pyridinyl)methylsulphinyl]-1H-benzimidazole, 2-[3-methyl-4-pyridinyl)methylsulphinyl]-1H-benzimidazole, 2-[3-methyl-4-pyridinyl)methylsulphinyl]-1H-benzimidazole, 2-[3-methyl-4-pyridinyl)methylsulphinyl]-1H-benzimidazole, 2-[3-methyl-4-pyridinyl)methylsulphinyl]-1H-benzimidazole, 2-[3-methyl-4-pyridinyl]methylsulphinyl]-1H-benzimidazole, 2-[3-methyl-4-pyridinyl]methylsulphinyl]-1H-benzimidazole, 2-[3-methyl-4-pyridinyl]methylsulphinyl]-1H-benzimidazole, 2-[3-methyl-4-pyridinyl]methylsulphinyl]-1H-benzimidazole, 2-[3-methyl-4-pyridinyl]methylsulphinyl]-1H-benzimidazole, 2-[3-methyl-4-pyridinyl]methylsulphinyl

(2,2,2-trifluoroethoxy)-2-pyridinyl)methylsulphinyl]-1Hbenzimidazole, 2-([4-[3-methoxypropoxy)-3-methylpyridin-2yl]methylsulphinyl)-1H-benzimidazole, (S)-2-[3-methyl-4(2,2,2-trifluoroethoxy)-2-pyridinyl)methylsulphinyl]-1H-

benzimidazole,  $(S)-2-\{[4-[3-methoxypropoxy)-3$ methylpyridin-2-yl]methylsulphinyl}-1H-benzimidazole, (S)-5-methoxy-2-((4-methoxy-3,5-dimethyl-2pyridylmethyl)sulphinyl}-1H-imidazo(4,5-b)pyridine, (R)-5methoxy-2-[(4-methoxy-3,5-dimethyl-2pyridinyl)methylsulphinyl]-1H-benzimidazole, (R)-5difluoromethoxy-2-[(3,4-dimethoxy-2pyridinyl)methylsulphinyl]-1H-benzimidazole, (R)-2-[3methyl-4-(2,2,2-trifluoroethoxy)-2pyridinyl)methylsulphinyl]-1H-benzimidazole, (R)-2-{(4-(3methoxypropoxy)-3-methylpyridin-2-yl)methylsulphinyl}-1Hbenzimidazole and (R)-5-methoxy-2-((4-methoxy-3,5-dimethyl-2-pyridylmethyl)sulphinyl)-1H-imidazol(4,5-b)pyridine and 5-methoxy-2-((4-methoxy-3,5-dimethyl-2in pyridylmethyl)sulphinyl}-1H-imidazo(4,5-b)pyridine, enantiomerically pure or enantiomerically enriched form comprising oxidizing a corresponding sulfide of said proton pump inhibitor (PPI) wherein the oxidation is carried out in the presence of a chiral zirconium complex.

3. (Previously presented) The process according to Claim 1, wherein the optically pure PPI having a sulfinyl structure is obtained in an optical purity of > 90%.

- 4. (Previously presented) The process according to Claim 1, wherein the oxidation is carried out using cumene hydroperoxide.
- 5. (Previously presented) The process according to Claim 1, wherein the chiral zirconium complex is selected from the consisting of zirconium(IV) acetylacetonate, group zirconium(IV) butoxide, zirconium(IV) tert-butoxide, ethoxide, zirconium(IV) n-propoxide, zirconium(IV) isopropoxide and zirconium(IV) zirconium(IV) isopropoxide/isopropanol, and wherein the chiral hafnium group consisting of is selected from the complex hafnium(IV) acetylacetonate, hafnium(IV) butoxide, hafnium(IV) ethoxide, hafnium(IV) tert-butoxide, hafnium(IV) n-propoxide, hafnium(IV) isopropoxide and hafnium(IV) isopropoxide/isopropanol.
- 6. (Previously presented) The process according to Claim 2, wherein the chiral zirconium complex is selected from the group consisting of zirconium(IV) acetylacetonate, zirconium(IV) butoxide, zirconium(IV) tert-butoxide, zirconium(IV) ethoxide, zirconium(IV) n-propoxide,

zirconium(IV) isopropoxide and zirconium(IV)
isopropoxide/isopropanol.

## 7- 9. (Canceled)

- 10. (Previously presented) The process according to Claim
  1, wherein the oxidation is carried out in the presence of
  an organic base.
- 11. (Previously presented) The process according to Claim
  1, wherein the oxidation is carried out in the presence of
  a tertiary amine.
- 12. (Previously presented) The process according to Claim 1, wherein the oxidation is carried out in an organic solvent.
- 13. (Previously presented) The process according to Claim 1, wherein the oxidation is carried out in an organic solvent comprising 0 to 0.3% by volume of water.

14. (Previously presented) The process according to Claim

1, wherein the oxidation is carried out in an organic solvent which comprises methyl isobutyl ketone.

## 15-21. (Canceled)

(Withdrawn) An optically pure PPI prepared by the 22. process according to claim 1 selected from the group consisting of (S)-5-methoxy-2-[(4-methoxy-3,5-dimethyl-2-(S) -2 - [3 pyridinyl) methylsulphinyl] -1H-benzimidazole, methyl-4-(2,2,2-trifluoroethoxy)-2pyridinyl) methylsulphinyl] -1H-benzimidazole,  $(S) - 2 - \{ [4 - (3$ methoxypropoxy) -3-methylpyridin-2-yl]methylsulphinyl}-1Hbenzimidazole or (S)-5-methoxy-2-((4-methoxy-3,5-dimethyl-(R) -2-pyridylmethyl)sulphinyl)-1H-imidazo[4,5-b]pyridine, 5-methoxy-2-[(4-methoxy-3,5-dimethyl-2-pyridinyl)methyls-(R)-5-difluoromethoxy-2ulphinyl]-1H-benzimidazole, [(3,4-dimethoxy-2-pyridinyl)methylsulphinyl]-1Hbenzimidazole, (R)-2-[3-methyl-4-(2,2,2-trifluoroethoxy)-2pyridinyl)methylsulphinyl]-1H-benzimidazole, (R)-2-{[4-(3methoxypropoxy)-3-methylpyridin-2-yl]methylsulphinyl}-1Hbenzimidazole and (R)-5-methoxy-2-((4-methoxy-3,5-dimethyl-2-pyridylmethyl)sulphinyl)-1H-imidazo[4,5-b]pyridine.

- 23. (Previously presented) The process according to Claim 1, wherein the oxidation is carried out in the presence of a chiral auxiliary.
- 24. (Previously presented) The process according to Claim 23, wherein the chiral auxiliary is a chiral tartaric acid derivative.
- 25. (Previously presented) The process according to Claim 23, wherein the chiral auxiliary is selected from the group consisting of (+)-L-tartaric acid bis-(N,N-diallylamide), (+)-L-tartaric acid bis-(N,N-dibenzylamide), (+)-L-tartaric acid bis-(N,N-diisopropylamide), (+)-L-tartaric acid bis-(N, N-dimethylamide), (+)-L-tartaric acid bis-(Nacid bis-(Npyrrolidinamide), (+)-L-tartaric piperidinamide), bis-(N-(+)-L-tartaric acid morpholinamide), acid bis-(N-(+)-L-tartaric cycloheptylamide), (+)-L-tartaric acid bis-(N-4-methyl-Npiperazinamide), dibutyl (+)-L-tartrate, di-tert-butyl (+)-L-tartrate, diisopropyl (+)-L-tartrate, dimethyl (+)-Ltartrate, diethyl (+)-L-tartrate, (-)-D-tartaric acid bis-(N, N-diallylamide), (-)-D-tartaric acid bis-(N,N-

dibenzylamide), (-)-D-tartaric acid bis-(N,N-disopropylamide), (-)-D-tartaric acid bis-(N,N-dimethylamide), (-)-D-tartaric acid bis-(N-pyrrolidinamide, (-)-D-tartaric acid bis-(N-piperidinamide), (-)-D-tartaric acid bis-(N-piperidinamide), (-)-D-tartaric acid bis-(N-d-methyl-N-cycloheptylamide), (-)-D-tartaric acid bis-(N-4-methyl-N-piperazinamide), dibutyl (-)-D-tartrate, di-tert-butyl (-)-D-tartrate, disopropyl (-)-D-tartrate, dimethyl (-)-D-tartrate and diethyl (-)-D-tartrate.

- 26. (Previously presented) The process according to Claim 23, wherein the chiral auxiliary is selected from the group consisting of (+)-L-tartaric acid bis-(N,N-dimethylamide), (+)-L-tartaric acid bis-(N-pyrrolidinamide), (+)-L-tartaric acid bis-(N-pyrrolidinamide), (-)-D-tartaric acid bis-(N,N-dimethylamide), (-)-D-tartaric acid bis-(N-pyrrolidinamide) or (-)-D-tartaric acid bis-(N-pyrrolidinamide).
- 27. (Previously presented) The process according to Claim 23, wherein the chiral zirconium complex is selected from the group consisting of zirconium(IV) acetylacetonate, zirconium(IV) butoxide, zirconium(IV) tert-butoxide, zirconium(IV) ethoxide, zirconium(IV) n-propoxide,

isopropoxide, and zirconium(IV) zirconium(IV) isopropoxide/isopropanol, and wherein the chiral auxiliary is selected from the group consisting of (+)-L-tartaric acid bis-(N,N-diallylamide), (+)-L-tartaric acid bis-(N,N-(+)-L-tartaric acid bis-(N,Ndibenzylamide), (+)-L-tartaric bis-(N,Ndiisopropylamide), acid (+)-L-tartaric acid bis-(Ndimethylamide), (+)-L-tartaric bis-(Nacid pyrrolidinamide), (+)-L-tartaric bis-(Npiperidinamide), acid (+)-L-tartaric acid bis-(Nmorpholinamide), cycloheptylamide), (+)-L-tartaric acid bis-(N-4-methyl-Npiperazinamide), dibutyl (+)-L-tartrate, di-tert-butyl (+)-L-tartrate, diisopropyl (+)-L-tartrate, dimethyl (+)-Ltartrate, diethyl (+)-L-tartrate, (-)-D-tartaric acid bisbis-(N,N-(N, N-diallylamide), (-)-D-tartaric acid bis-(N,N-(-)-D-tartaric acid dibenzylamide), (-)-D-tartaric bis-(N,Nacid diisopropylamide), (-)-D-tartaric dimethylamide), acid bis-(N-(-)-D-tartaric bis-(Nacid pyrrolidinamide), acid bis-(N-(-)-D-tartaric piperidinamide), (-)-D-tartaric acid bis-(Nmorpholinamide), cycloheptylamide), (-)-D-tartaric acid bis-(N-4-methyl-Npiperazinamide), dibutyl (-)-D-tartrate, di-tert-butyl (-)- D-tartrate, diisopropyl (-)-D-tartrate, dimethyl (-)-D-tartrate and diethyl (-)-D-tartrate.

28. (Previously presented) The process according to Claim 23, wherein the chiral zirconium complex is selected from group consisting of zirconium(IV) acetylacetonate, the butoxide, zirconium(IV) tert-butoxide, zirconium(IV) ethoxide, zirconium(IV) n-propoxide, zirconium(IV) zirconium(IV) zirconium(IV) isopropoxide, or isopropoxide/isopropanol complex, wherein the auxiliary is selected from the group consisting of (+)-Ltartaric acid bis-(N,N-diallylamide), (+)-L-tartaric acid bis-(N,N-dibenzylamide), (+)-L-tartaric acid bis-(N,Nbis-(N,Ndiisopropylamide), (+)-L-tartaric acid dimethylamide), (+)-L-tartaric bis-(Nacid bis-(Npyrrolidinamide), (+)-L-tartaric acid bis-(Npiperidinamide), acid (+)-L-tartaric (+)-L-tartaric bis-(Nacid morpholinamide), cycloheptylamide), (+)-L-tartaric acid bis-(N-4-methyl-Npiperazinamide), dibutyl (+)-L-tartrate, di-tert-butyl (+)-L-tartrate, diisopropyl (+)-L-tartrate, dimethyl (+)-Ltartrate, diethyl (+)-L-tartrate, (-)-D-tartaric acid bis-(N, N-diallylamide), (-)-D-tartaric acid bis-(N,N-

| dibenzylamide),   | (-)-D-tartaric      | acid      | bis-(N,N-    |
|---|---------------------|-----------|--------------|
| diisopropylamide),  | (-)-D-tartaric      | acid      | bis-(N,N-    |
| dimethylamide),   | (-)-D-tartaric      | acid      | bis-(N-      |
| pyrrolidinamide),   | (-)-D-tartaric      | acid      | bis-(N-      |
| piperidinamide),  | (-)-D-tartaric      | acid      | bis-(N-      |
| morpholinamide),  | (-)-D-tartaric      | acid      | bis-(N-      |
| cycloheptylamide),  | (-)-D-tartaric acio | d bis-(N- | -4-methyl-N- |
| piperazinamide), dibutyl (-)-D-tartrate, di-tert-butyl (-)- |                     |           |              |
| D-tartrate, diisopropyl (-)-D-tartrate, dimethyl (-)-D-     |                     |           |              |
| tartrate and dieth  | nyl (-)-D-tartrate, | and w     | herein the   |
| oxidation is carrie   | d out in the pres   | sence of  | an organic   |
| base.   |                     |           |              |

29. (Previously presented) The process according to Claim 23, wherein the chiral auxiliary is selected from the group consisting of (+)-L-tartaric acid bis-(N,N-dimethylamide), (+)-L-tartaric acid bis-(N-pyrrolidinamide), (+)-L-tartaric acid bis-(N-morpholinamide, (-)-D-tartaric acid bis-(N,N-dimethylamide), (-)-D-tartaric acid bis-(N-pyrrolidinamide) and (-)-D-tartaric acid bis-(N-morpholinamide), and wherein the oxidation is carried out in the presence of an organic base.

- 30. (Previously presented) The process according to Claim 23, wherein the chiral auxiliary is selected from the group consisting of (-)-D-tartaric acid bis-(N,N-dimethylamide), (-)-D-tartaric acid bis-(N-pyrrolidinamide) and (-)-D-tartaric acid bis-(N-morpholinamide), and wherein the optically pure PPI prepared by the process is (+)-pantoprazole.
- 31. (Currently Amended) The process according to Claim 23, wherein the chiral zirconium complex is selected from the zirconium(IV) n-propoxide, of is consisting group zirconium(IV) zirconium(IV) isopropoxide or isopropoxide/isopropanol complex, wherein the chiral auxiliary is selected from the group consisting of (+)-Ltartaric acid bis-(N,N-dimethylamide), (+)-L-tartaric acid bis-(N-pyrrolidinamide) and (+)-L-tartaric acid bis-(Nmorpholinamide), wherein the oxidation is carried out using cumene hydroperoxide.
- 32. (Previously presented) The process according to Claim 23, wherein the chiral zirconium complex is selected from the group consisting of zirconium(IV) n-propoxide, zirconium(IV) isopropoxide and zirconium(IV)

isopropoxide/isopropanol complex, wherein the chiral auxiliary is selected from the group consisting of (+)-L-tartaric acid bis-(N,N-dimethylamide), (+)-L-tartaric acid bis-(N-pyrrolidinamide) or (+)-L-tartaric acid bis-(N-morpholinamide), wherein the oxidation is carried out using cumene hydroperoxide in the presence of a tertiary amine.

33. (Currently amended) A process for preparing an optically pure proton pump inhibitor (PPI) having a sulfinyl structure selected from the group consisting of 5-methoxy-2-[(4-methoxy-3,5-dimethyl-

2-pyridinyl) methylsulphinyl] -1H-benzimidazole, (S)-5-methoxy-2-[(4-methoxy-3,5-dimethyl-

2-pyridinyl)methylsulphinyl]-1H-benzimidazole, 2-[3-methyl-4-(2,2,2-trifluoroethoxy)-2-pyridinyl)methylsulphinyl]-1H-benzimidazole, 2-[[4-[3-methoxypropoxy)-3-methylpyridin-2-yl]methylsulphinyl]-1H-benzimidazole, and 5-methoxy-2-((4-methoxy-3,5-dimethyl-2-pyridylmethyl)sulphinyl]-1H-imidazo-(4,5-b)pyridine in enantiomerically pure or enantiomerically enriched form comprising oxidizing a corresponding sulfide of said PPI, wherein the oxidation is carried out in the presence of a chiral zirconium complex or a chiral hafnium complex.

34. - 38. (Canceled)